CLAIMS

What is claimed is:

1. A method of simulating movement of a seat-belted occupant and estimating an amount of forwardly-directed displacement undergone by said seat-belted occupant with respect to an occupant's seat, comprising the steps of:

securing a test dummy at a first point that is both fixed with respect to said test dummy and fixed with respect to a fixed frame of reference, said first point selectively acting as a pivot point for said test dummy;

applying a linear force to a second point that is fixed with respect to said test dummy and offset from said first point, said linear force causing a measurable amount of forward-directed displacement of said second point with respect to said fixed frame of reference while causing said test dummy to pivot about said first point;

establishing a third point that is fixed with respect to said test dummy and offset from said first point and said second point, said third point undergoing an amount of forward-directed displacement with respect to said fixed frame of reference due to said pivoting of said test dummy; and

estimating an amount of said forward-directed displacement occurring at said third point by multiplying said measurable amount of forward-directed displacement

occurring at said second point by a ratio AD/AB, where AD represents a distance between said first point and said third point and where AB represents a distance between said first point and said second point.

2. The method according to claim 1, further comprising the step of adjusting said estimated amount of forward-directed displacement occurring at said third point to account for a difference between a location of said third point and a location of an outermost point of said test dummy most likely to first make contact with an object or defined region of space lying in front of said test dummy.

3. The method according to claim 2, wherein said outermost point of said test dummy is a nose of said test dummy.

4. The method according to claim 2, wherein said adjusting step comprises the addition of an offset representing a distance between said third point and said outermost point of said test dummy.

5 The method according to claim 1, further comprising the step of restraining said first point to said fixed frame of reference by means of a rigid, non-extendable member, with one end of said member attaching to said fixed frame of reference while an opposite end of said member attaches to said first point.

6. The method according to claim 1, further comprising the step of restraining said first point to said fixed frame of reference by means of a flexible tether, with one end of said tether attaching to said fixed frame of reference while an opposite end of said tether attaches to said first point, said tether restricting forward displacement of said first point with respect to said fixed frame of reference once said measurable amount of forward-directed displacement of said second point is equal to a length of said tether.

7. The method according to claim 1, further comprising the steps of:

measuring an amount of time that said test dummy was subject to said application of said linear force; and

estimating a velocity of said test dummy by dividing said estimated amount of forward-directed displacement by said measured amount of time.

8. A system for simulating a seat-belted occupant of a vehicle and estimating an amount of forwardly-directed displacement of said occupant, comprising:

a test dummy representing the seat-belted occupant;

a first point fixed with respect to said test dummy and with respect to a fixed frame of reference, said first point selectively acting as a pivot point for said test dummy;

a second point fixed with respect to said test dummy and offset with respect to said first point; and

a third point fixed with respect to said test dummy and offset with respect to said first point and said second point,

wherein application of a linear component of a force at said second point causes a measurable amount of forward-directed linear displacement of said second point with respect to said fixed frame of reference while pivoting said test dummy about said first point in both a forward and downward direction, said pivoting of said test dummy resulting in forward displacement of said third point with respect to said fixed frame of reference, said forward displacement of said third point being estimated by multiplying said measurable amount of forward displacement of said second point by a ratio AD/AB, where AD represents a distance between said first point and said third point and where AB represents a distance between said first point and said second point.

9. The system according to claim 8, wherein said fixed frame of reference comprises a support guide upon which said test dummy is movably supported.

10. The system according to claim 9, further comprising a drive guide associated with said support guide, said drive guide pivotably supporting said test dummy and capable of being linearly displaced along said support guide in both a forwards and backwards direction.

11. The system according to claim 10, further comprising a support brace affixed to said test dummy and connecting said test dummy to said drive guide.

12. The system according to claim 11, wherein said first and second points are located on said support brace, and said third point is located on said test dummy.

13. The system according to claim 9, further comprising a restraining system that fixes said first point with respect to said support guide.

14. The system according to claim 12, further comprising a restraining system that fixes said first point with respect to said support guide.

15. The system according to claim 13, wherein said restraining system comprises a rigid, non-extendable member, with one end of said member attaching to said support guide while an opposite end of said member attaches to said first point.

16. The system according to claim 13, wherein said restraining system comprises a flexible tether, with one end of said tether attaching to said support guide while an opposite end of said tether attaches to said first point, said tether restricting forward-directed displacement of said first point with respect to said fixed frame of reference once said measurable amount of forward-directed linear displacement of said second point is equal to a length of said tether.

17. The system according to claim 16, wherein said estimation of said forward displacement occurring at said third point is established with respect to a starting position of said test dummy, said starting position corresponding to a state of said system where any forward displacement at said second point results in said test dummy beginning to tilt about said first point.

18. The system according to claim 17, further comprising an inclinometer mounted at or nearby said second point, said inclinometer detecting when said test dummy begins to tilt about said first point, thereby indicating when said test dummy is in said starting position.

19. The system according to claim 18, wherein said estimated displacement of said third point is adjusted to account for a difference between a location of said third point and a location of an outermost point of said test dummy, said outermost point of said test dummy being that portion of said test dummy most likely to first make contact with an object or defined region of space lying in front of said test dummy.

20. The system according to claim 19, wherein said adjustment of said estimated displacement of said third point includes the addition of an offset representing a distance between said third point and said outermost point of said test dummy.

21. The system according to claim 8, wherein a velocity of said test dummy can be estimated by dividing said estimated amount of forward displacement of said third point by an amount of time during which said test dummy underwent displacement due to application of said linear component of said force at said second point.